

34. A haptic feedback touch control as recited in claim 23 wherein said surface member is a palm surface coupled to a housing of said computer and located to the side of said touch input device.

35. A haptic feedback touch control as recited in claim 23 wherein sound electronics of said computer are used to drive said at least one actuator.

36. A method for providing haptic feedback to a touch input device that provides input to a computer device, said computer device implementing a graphical environment, the method comprising:

providing said touch input device that is contacted by a user, said touch input device including at least one sensor for determining a location of said contact on a planar surface of said touch input device by said user and providing said computer device with a position signal indicating said location; and

providing an actuator coupled to said touch input device, said actuator receiving control signals derived from force information output by said computer device, wherein said force information causes said actuator to output a force on said touch input device, said force being correlated with an interaction occurring in said graphical environment between said cursor and a different graphical object, wherein said force causes said touch input device to translate laterally and approximately parallel to said planar surface of said touch input device.

37. A method as recited in claim 36 wherein said computer device positions a cursor in said graphical environment based at least in part on said position signal.

38. A method as recited in claim 36 wherein said force output on said touch input device causes said touch input device to oscillate in two directions.

39. A method as recited in claim 37 wherein a touch device microprocessor, separate from a host processor of said computer device, receives said force information from said host processor and causes said control signals to be sent to said actuator.

40. A method as recited in claim 37 wherein said interaction occurring in said graphical environment includes a collision between said cursor and said different graphical object.

41. A method as recited in claim 39 wherein said interaction occurring in said graphical environment includes a selection of said different graphical object by said cursor, wherein said different graphical object is one of an icon, a window, and a menu item.

42. A method as recited in claim 41 wherein said computer device is portable and said touch input device is integrated in a housing of said computer device.

43. An actuator providing a linear force output, the actuator comprising:

a grounded ferromagnetic piece including a center pole located between two side poles;

a coil wrapped around said center pole;

a magnet positioned adjacent to said center pole and said side poles, wherein an air gap is provided between said magnet and said ferromagnetic piece; and

a backing plate coupled to said magnet, wherein said backing plate and said magnet move with respect to said grounded ferromagnetic piece when current is flowed in said coil.

44. An actuator as recited in claim 43 further comprising rollers positioned between said ferromagnetic piece and said backing plate to allow said relative motion between said backing plate and said ferromagnetic piece.

45. An actuator as recited in claim 44 wherein said rollers are constrained by a cage member.

46. An actuator as recited in claim 43 further comprising a flexure coupled between said backing plate and said ferromagnetic piece, said flexure reducing relative motion between said backing plate and said ferromagnetic piece in undesired directions and providing a spring centering force between said backing plate and said ferromagnetic piece.

47. An actuator as recited in claim 43 wherein said backing plate is made of steel.

48. An actuator as recited in claim 43 wherein an entire thickness of said actuator is approximately 4 millimeters or less.

49. A haptic touch device comprising:

a piezoelectric transducer coupled to a ground, said piezoelectric transducer including a metal diaphragm coupled to a ceramic element;

a planar sensing element operative to sense a location of a contact from a user on a surface of said planar sensing element;

a spacer provided between said piezoelectric transducer and said planar sensing element, wherein said metal diaphragm contacts said spacer; and

a spring element coupled between said planar sensing element and said ground, said spring element providing a spring restoring force to said planar sensing element.

50. A haptic touch device as recited in claim 49 wherein said piezoelectric transducer is driven with a signal approximately at a natural frequency of said haptic touch device.

51. A haptic touch device as recited in claim 49 wherein said natural frequency can be adjusted by adjusting a spring constant of said spring element or adjusting a mass of said spacer or said planar sensing element.

52. A method for providing haptic feedback to a touch input device that provides input to a computer device, said computer device implementing a graphical environment, the method comprising:

receiving a position signal from said touch input device, said position signal indicating a contact location on a surface of said touch input device where said user is pressing said surface;

determining in which of a plurality of regions said contact location is positioned, wherein said surface of said touch input device is divided into said plurality of regions; and

providing force information to cause at least one actuator to output a force to said user operating said touch input device, said force associated with said user moving an object on or over said surface of said touch input device.

53. A method as recited in claim 52 further comprising implementing a function associated with said region in which said contact location is positioned.